Research Article

Flexible engineering degree programs with remote access laboratories in an Australian regional university known for its excellence in e-learning

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Article first published online: 25 FEB 2009

DOI: 10.1002/cae.20284

Issue

Computer Applications in Engineering Education

Volume 19, Issue 1, pages 18–25, March 2011

Additional Information (Show All)

How to Cite | Author Information | Publication History

Abstract | Article | References | Cited By

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Keywords: flexile delivery; e-learning; innovative residential school; remote access laboratories; USQ*Online*; distance learning; engineering degree

Abstract

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Flexible delivery of education is the starting point for discussion in this article. The e-learning history of the University of Southern Queensland (USQ) was used to contextualize the article. USQ*Online* was mentioned next. The article then describes the Distance and e-Learning Centre (DeC) in USQ. It then focused on the innovative delivery of USQ engineering degree programs, where the course flexibility was then highlighted together with their innovative residential schools and future remote access laboratories at USQ; an example of a remotely accessible laboratory was also mentioned. A large number of international and domestic students enrolled in USQ Bachelor of Engineering programs since their inception by external mode only. Finally, the article discussed distance education and e-learning in USQ and Australia. © 2009 Wiley Periodicals, Inc. Comput Appl Eng Educ 19: 18–25, 2011

INTRODUCTION

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Flexible delivery, based primarily on the application of distance education technologies and methodologies, is the key to the future of education and training. It could well be the only viable option to meet the escalating worldwide need for lifelong learning, for as Taylor has pointed out that traditional education systems throughout the world have been stretched to the limit by the population explosion, scarcity of resources and expansion of knowledge 1,2. In the future, flexible delivery is likely to play a more significant role at all levels of education and training as globalization becomes the norm. Because of its tradition and expertise in distance education, Australia is well placed to become a leader in flexible delivery.

In many contexts, including continuing professional education, the clientele for distance education consists mainly of part-time students in full-time employment. Distance educators have, therefore, had to provide teaching-learning resources (printed study guides, audiotapes, videotapes, computer-based courseware, etc.) of high quality that could be used at a time and in a place convenient to each student. In effect, these "flexible access" technologies allow the student to turn "the teacher" on, or off, at will as lifestyle permits. Similarly, access to the Internet facilitates interactivity, without sacrificing the benefits of flexible access, since it can be used to support asynchronous communication. Such flexibility has a major pedagogical benefit—it allows students to progress at their own pace. Thus varying rates of individual progression can be accommodated, unlike in typical conventional educational practices where the whole class tends to progress at the same pace in synchronization with the delivery of information through mass lectures and tutorials. Some of the characteristics of the various models of distance education that are relevant to the quality of teaching and learning are summarized in Table 1 1,2.

Although many universities are just beginning to implement fourth generation distance education initiatives, the fifth generation is already emerging based on the further exploitation of new technologies. The fifth generation of distance education is essentially a derivation of the fourth generation, which aims to capitalize on the features of the Internet and the Web.

The widespread use of the Internet worldwide in the last 11 years has encouraged universities and other educational institutions to provide educational courses using this medium. The University of Southern Queensland (USQ) started to offer a Graduate Certificate Course in Distance Education via the Internet 8 years ago. With the success of this offer, USQ formally launched 23 of its award courses worldwide through the Internet on USQ*Online* on May 19, 1999 3. USQ*Online* is title of the system developed by USQ to offer its courses via the Internet. Students anywhere in the world can now enrol in courses through the Internet. The Faculty of Engineering and Surveying (FOES) of USQ has been delivering four Graduate Certificate Courses via the internet since semester 2, July 1999. These Graduate Courses are the first of their kind in Australia. USQ was recognized as Australia's University of the Year for its excellence in distance learning and the best e-University for the Year 2000–2001 derives its fame from here 4–7. It is necessary to stress that USQ is not a virtual university; it is a traditional university with over 5,000 on-campus students. However, USQ uses three ways of delivering her programs to the domestic and international communities, namely: on-campus mode, the traditional distance education with study books and other multimedia mode, and through the Internet 8,9. In addition, USQ is well recognized globally as one of the leading flexible provider of tertiary education as evidenced by the recent visit from the Tokyo Development Learning Centre (World Bank) in April 2007. In response to the new accreditation of our programs by the Institution of Engineers, Australia (IE*Aust*), in 2007, the FOES has made modifications to our existing programs to meet the aspirations of our students, demands by employers and professional requirements of the IE*Aust*.

Table 1. Models of Distance Education: A Conceptual Framework

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Models of distance education and associated delivery technologies	Characteristics of delivery technologies				
	Flexibility			Highly refined materials	Advanced interactive delivery
	Time	Place	Pace		
First generation—The correspondence model					
Print	Yes	Yes	Yes	Yes	No
Second generation—The multi-media model					
Print	Yes	Yes	Yes	Yes	No
Audiotape	Yes	Yes	Yes	Yes	No
Videotape	Yes	Yes	Yes	Yes	No
Computer-based learning (e.g., CML/CAL)	Yes	Yes	Yes	Yes	Yes
Interactive video (disk and tape)	Yes	Yes	Yes	Yes	Yes
Third generation—The telelearning model					
Audioteleconferencing	No	No	No	No	Yes
Videoconferencing	No	No	No	No	Yes
Audiographic communication	No	No	No	Yes	Yes
Broadcast TV/Radio and Audioteleconferencing	No	No	No	Yes	Yes
Fourth generation—The flexible learning model					
Interactive multimedia (IMM)	Yes	Yes	Yes	Yes	Yes
Internet-based access to WWW resources	Yes	Yes	Yes	Yes	Yes
Computer mediated communication	Yes	Yes	Yes	No	Yes
Fifth generation—The intelligent flexible learning model					
Interactive multimedia (IMM) online	Yes	Yes	Yes	Yes	Yes
Internet-based access to WWW resources	Yes	Yes	Yes	Yes	Yes
Computer-mediated communication, using automated response systems	Yes	Yes	Yes	Yes	Yes
Campus portal access to institutional processes and resources	Yes	Yes	Yes	Yes	Yes

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The USQ is 1 of the 37 publicly funded universities in Australia. The University's principal focus is on teaching supported by research and scholarship. The main campus of the university is situated in Toowoomba, 130 km west of Brisbane; other campuses are in located in Fraser Coast, and Springfield. Since its inception in 1967, USQ has established a reputation as a leading distance education provider [7,10–12]. USQ offers programs ranging from associate degree to degrees at Masters and Doctorate level through its five faculties. The five faculties are Arts, Business, Education, Engineering and Surveying, and Sciences [13]. Of the 26,000 students, ~5,000 students study on campus of whom 700 are international students representing 42 different nations. The remaining 21,000 students, 5,000 of whom live overseas in 60 countries, study off campus by distance education [14].

USQ was awarded the Commonwealth of Learning Award of Excellence for Institutional Achievement at the third Pan-Commonwealth Forum on Open Learning, in July 2004 and in 1999, USQ won the Inaugural Award for Excellence from the International Council for Open and Distance Education (ICDE), as a world leader in "dual mode" (on-campus and off-campus) education [15].

e-Delivery for USQ Programs

USQ*Online* is the system developed by USQ to offer its programs via the Internet. More than 40 university-accredited undergraduate and postgraduate degree, certificate and diploma programs, courses for credit and professional development are available for study via USQ*Online*. Students may choose to study one or more courses or an entire program via USQ*Online* (depending on availability), thereby tailoring your study to suit your individual needs. USQ*Online* is accessible 24 h a day, 7 days a week, so therefore students can study in their own time at their own pace, at the office or at home—whenever it is convenient. Campus visits are not necessary.

USQ*Online* will be supported by the USQ*Online* Support Centre to provide for the needs of both USQ*Online* in the short term and USQ more broadly in the longer term. All enquires for USQ*Online* will be directed through this Support Centre. To provide advice and support to prospective and enrolled students about USQ*Online*, a network of Online Marketing Representatives (OMRs) called the "USQ Net" will be established throughout the world. Based on the current market targets for semester 24, July 2006, OMRs will be based on Australia, Singapore, Hong Kong, Malaysia, the United States, Canada, United Kingdom, and Germany.

However, despite the heavy investment made by the USQ, both the Vice-Chancellor and the Deputy Vice-Chancellor have stressed that the Internet delivery of our programs via USQ*Online* was neither more important, nor less important, than our on-campus delivery or our "traditional" off campus delivery but was complementary to them [3,8,9].

Distance and e-Learning Centre (DeC), USQ

Having prescribed and written down the teaching materials, the examiner passes the materials to the moderator for moderation. The materials are then passed to the DeC for further processing. As well as being the "production house" for the design, development, production, and distribution of USQ study materials, including the e-learning materials, DeC provides a range of services to specifically meet the needs of academic staff involved in teaching and learning activities across the University. DeC offers a range of activities for USQ staff through its monthly DeC Workshop/Seminar Series and is involved in research into Distance and e-Learning, the use of new technologies, online education and other related fields.

Most courses of study have three items in each learning package: an introductory book; a study book; and a book of selected readings. Many learning packages also include other items such as computer managed assessment (CMA), audio or videotapes, CD-ROM, books of worked solutions and computer disks. Figure 1 shows the course development process in DeC, USQ [16]. The production process starts with *Planning and Scheduling*. Scheduling begins a year in advance of the actual teaching period. Submission dates are determined by the change cycle (new, major, minor, or no change). Tracking information is available on a campus-wide materials database, which covers learning packages from the planning phase to the dispatch phase.

Figure 1. Course development process in Dec, USQ. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

The Faculty of Engineering and Surveying

The FOES is one of the foundation faculties of the University. At the moment, there are more than 3,000 students studying different types of award programs, of whom 80% are off campus studying through distance education or dual mode. The Faculty's teaching is supported by a solid foundation of research and scholarship, evidenced by a number of research centers, of which the largest is the Centre of Excellence in Engineering Fibre Composites (CEEFC). The facilities of the FOES include a newly built AUD 10.8 million Engineering and Surveying Building, advanced finite element and CAD laboratories, robotic and mechatronic laboratories, modern materials research and testing facilities, and signal processing, microprocessor system design, and advanced electronic laboratories [13,14].

Engineering Degree Programs and Practice Courses

There are three types of first engineering degree programs in the FOES, USQ, namely: Bachelor of Engineering (BEng), Bachelor of Engineering Technology (BEngTech) and Associate Degree (AD) in Engineering (USQ, 2000). The BEng is the flagship of the Faculty. It is a 4-year on-campus full-time program but students can study it externally over a period of 10 years or a combination of on-campus and off-campus. The program is offered in the disciplines of Agricultural, Civil, Computer Systems, Electrical and Electronic, Software Engineering, Environmental, Instrumentation and Control, Mechanical and Mechatronic Engineering. The BEngTech is a 3-year on-campus full time program but students can study it by distance education over a period of 6 years. The AD is a 2-year full-time on campus program but students can study it externally over a period of 4 years.

Five non-course based residential school sessions, each of 50 h duration, of which 40 h are for practical work and 10 h are for background reading, were developed for each discipline of the Bachelor of Engineering (BEng) program and other engineering degree programs offered by USQ. One of the non-course based residential school sessions is the core unit, *Engineering Practice 1*, which develops basic engineering skills like instrumentation, measurement, and analysis of data through a series of practical work exercises. This unit must be attended by all students of the Faculty, irrespective of type of degree programs and of discipline area 10,11. In 2006, two modes of delivery of residential school sessions are available. The on-campus students will complete each course by performing 4 h of practical work per week over a period of 10 weeks; while the external candidates will need to attend a continuous 40 h of practical work over a period of 1 week for every residential school session.

In order to simplify our discussion, let us use the mechanical engineering discipline as an example. In addition to the core practical course, *Engineering Practice 1*, there are four more practical courses, *Mechanical Practice 1* through *Mechanical Practice 4*. Table 2 shows how the five practical courses are taken by students from different types of award programs in mechanical engineering discipline. On campus BEng students will be enrolled in *Engineering Practice 1* and *Mechanical Practice 1* in their first year of their study, *Mechanical Practice 2* in the second year and *Mechanical Practice 3* and *Mechanical Practice 4* in the third. It should be emphasized that the "*Practice*" courses do not solely foster the development of practical skills and expose students to engineering components and systems. These courses will also be used to engender students in communication skills, teamwork skills such as negotiation, and time management skills 7.

In the final year, all students in the BEng program will have another two project based residential school sessions, *Professional Practice 1* and *Professional Practice*11. In *Professional Practice 1*, students will be presented with research methodology for dealing with their dissertation; in *Professional Practice 2*, students will be required to present their project work to their peers and members of staff of the Faculty.

Off campus BEng students will need 8 years of part-time study to complete the program and their five non-course specific practical work and two project-based residential school sessions will be arranged that within 8 years of study, they will need only to come to USQ a maximum of four times; the students will have to spend 2 weeks in USQ each time. For those who are able to have some of their non-course based practical work courses done in their workplace or community, the number of their visits to the campus will be accordingly reduced.

Table 2. Practice Courses Taken by Different Programs

Courses	Programs		
	Bachelor of engineering	Bachelor of engineering technology	Associate degree
Engineering practice 1	•	•	•
Mechanical practice 1	•	•	•
Mechanical practice 2	•	•	•
Mechanical practice 3	•	•	•
Mechanical practice 4	•	•	
Professional practice 1	•		
Professional practice 2	•		

BEng Programs by External Study Only

Up to 1997, the BEng students at USQ could not complete their entire degree study by external study mode. They studied the first 6 years of their part-time course externally and were required to come to campus six or more times intermittently to perform their course-based residential school sessions. After that they were required to come to study for 1 year full-time on campus, same as on-campus BEng students. With the implementation of our innovative residential school sessions in 1998, USQ is able to offer BEng programs totally by external study but at the same time satisfy the requirements of the Institution of Engineers, Australia for professional engineering programs 17.

Hitherto, the totally off-campus mode of BEng programs have been offered by USQ for 10 years and accreditation for the programs had been given by Engineers Australia (EA) in 2007. This current accreditation is different from the previous ones in the sense that accreditation will be based on the learning outcomes of students for each attribute considered. This means that Engineers Australia will not only look at the details of each course taught in the university but EA will investigate to see whether the courses taught in a program will satisfy the learning outcomes for each attribute under consideration 19. The Bachelor of Engineering (Mechanical) was accredited based on the competency standards required as a mechanical engineer 20. In the documents submitted to Engineers Australia for re-accrediting USQ engineering degree programs for another 5 years, USQ will emphasize that off-campus students will need to come to USQ for 100 h of residential school every 2 years.

Since the introduction of Bachelor of Engineering program by off-campus study only, USQ has been attracting students from countries like Singapore, Hong Kong (Special Administrative Region of China), and Malaysia. These students are very eager to study in their program because they do not need to go to classrooms after work; they can study at their own time and at any place they want. They also know that the degree they obtain will be recognized by the professional institutions of their countries because of the Washington Accord 17. Communications between lecturers were made via Internet, telephone, and fax. The study desk platform currently used by USQ is Moodle, which had been proved to be quite efficient because an e-mail will also be sent to students guiding them to the study desk to read announcements or news. By having the above new methods of communications, student–student and student–lecturer interaction can never be better than now.

Remote Access Laboratories (RALs)

In order to improve access by our external students to our innovative residential schools and to cut costs on student side, the FOES decided to investigate the possibility of having remote access laboratories for our practical courses and a working party on this matter was set up in 2006. The main objectives of the working party were:

i. To recommend policies that would lead to the establishment of a Faculty remote access laboratory infrastructure.

ii. To establish a small number of fully operational remotely accessible laboratory experiments by July 2008. These pilot experiments must be carefully chosen so that they are representative of the full range of experiments that would eventually become remotely accessible.

iii. To work with Disciplines to develop RALs to reduce the number of practical courses.

The proposed infrastructure will be used to enable students to conduct experiments or use specific software packages to complete projects. In this document the term *experiment* is used to describe all those activities. From a hardware point of view the essential components are shown Figure 2. These are:

Figure 2. Essential requirements for remote laboratories.

- The client side (student) computers.
- A secure internet connection.

- Remote Experiment Server(s).
- Laboratory Host Computers (may be virtual with USB to IP hubs).
- Control and Data Acquisition Systems (Labview Based, SCADA/PLC based, linear/rotary actuators).
- Experiment Specific Laboratory Hardware.

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The main purpose of a remote experiment server is to allow communication between a legitimate user's computer on the client side and an available remote laboratory host that has been set-up to run the experiment requested by the user.

Applications that are used to perform *experiments* (generic term for laboratory work, laboratory experiment, or laboratory exercise using software only) are run on laboratory host computers. Typically these will be connected to experiment specific laboratory hardware via a control and data acquisition interface.

From a software point of view the essential components are:

- Remote Control Software.
- Remote Laboratory Management Software.
- Housekeeping Software.
- Experiment specific software.

Remote Control Software.

In simple terms the remote control software allows the client to assume control over the laboratory host computer. In other words operation of the client (student) side keyboard and mouse has the same effect as using the mouse and keyboard of the laboratory host computer. Also the remote control software displays, in a window on the client's side, the desktop of the laboratory host computer. Commercially available remote control software includes Microsoft's Windows Remote Desktop, VNC, PcAnywhere, and Sun Microsystems' Sun Secure Global Desktop (SGD).

Remote Laboratory Management Software.

It is essential to manage access to remote experiments. The remote access software normally authenticates the client, which means that authentication does not have to be an essential function of the remote laboratory manager software.

The Housekeeper Software.

The Housekeeper Software (*Housekeeper*) is necessary for resetting the host computer and experiment specific laboratory hardware to their original states after the end of a remote laboratory session. The *Housekeeper* should automatically execute every time a session is ended voluntarily by the client or forcefully by the remote laboratory manager. The *Housekeeper* has two parts. The part that is executed first returns laboratory specific hardware to its original state. For example, a motor may have to be in the off-state. That part should be custom written for each remote experiment. The other part should reset the remote laboratory computer (including its desktop) back to its original state.

Experiment Specific Software.

The experiment specific software is the application or applications that the client runs on the laboratory host computer during a booked session. In some cases the software being run will be explicit to the client. For example, the whole intention of the remote laboratory work may be to use specialist software such as Finite Element software or GIS software. More typically however, the experiment specific software being used will be completely or almost completely transparent to the user.

From the point of view of infrastructure requirements there are three types of remote experiments. These are:

i. Experiments that do not involve experiment specific laboratory hardware: For example, laboratory work involving solely the use of software programs (Finite Element, GIS).

ii. Experiments that involve experiment specific laboratory hardware accessed through a control and data acquisition system.

iii. Experiments where control and data acquisition are part of the experiment specific hardware, for example, laboratory work whose objectives are purely microcomputer or programmable logic controller (PLC) programming.

Example—Remotely Accessible Laboratories (RAL)

In order to make readers know more about USQ RAL, an example is mentioned in details. Figure 3a shows a transformer protection training system that is remotely accessible. Hardware based remote laboratory work invariable requires an interface layer between the hardware that is being tested or experimented on and the laboratory computer. This interface layer is needed for control and data acquisition 21.

Figure 3. SCADA controlled network fault simulator. The (a) hardware (b) software control. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Supervisory Control and Data Acquisition (SCADA) systems are widely used in industries. The software part of the SCADA system allows a screen-based Human Machine Interface (HMI) to be constructed which enables an operator to send control commands to plant being control through the PLC. It also allows selected data from the plant to be acquired through the PLC and displayed in an easily understood form on HMI. The HMI for the transformer protection system is shown in Figure 3b, which is a screenshot of what appears on the remote operator's desktop. It is essentially a mimic diagram of the plant to be controlled by the student. In this case, the plant is the transformer that can be energized and connected to a load by means of circuit breakers represented by squares on the diagram. The remote user can, through the HMI and PLC, close or open the circuit breakers and can initiate short circuits faults within or outside the transformer. The rectangle representing the circuit breaker turns red when ON and green when OFF. Students doing laboratory work are given the task of remotely programming a relay, which is shown at the top left hand side of Figure 3a. The relay monitors currents and opens the transformer circuit breakers, if, based on user-defined logic, it detects a short circuit fault within the transformer. The relay provides another means of data acquisition. Although this is not shown in Figure 2, students can open the relay's HMI and view remotely real time system data that is being continuously captured by the relay. In cases where the relay trips dur to a fault, they can view current waveforms and other data for construction of the sequence of events just prior to fault. Students may also be given the option of operating the system remotely for data acquisition. The top left hand side of Figure 3a illustrates a webcam which allows the remote operator view images of an alphanumeric display and a number of indicator light emitting diodes on the relay front panel 21.

It can be argued that the works of Djordjevic et al. in computer aided learning in computer architecture laboratory, Reynard et al. in flexible manufacturing cell SCADA system, and Altas and Aydar in a real-time computer-controlled simulator are potential candidates for RALs of USQ 22–24.

DISCUSSION

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The demand for distance education is accelerating across Australia, with some universities reporting a 50% increase of course enrolments during the past 2 years. Higher education leaders attribute the increase partly to more courses becoming available online and the availability of FEE-HELP loans from the Commonwealth Government of Australia. There has been an increase in demand for distance education in a broader sense that has come about by the electronic boom. People can go online to do their courses, have computer discs sent to them, and universities are making more courses available online. Student population in the metropolitan can now also take distance education courses when lecture and tutorial times do not fit their pattern, making it easy and accommodating for them to advance their education.

Gone are the days when distance education was primarily done by people living in remote and regional areas. These days more and more people in metropolitan areas are turning to it. Most people doing our distance education courses are working, many have families and want to be able to study off-campus and in their own time to enhance their career. The market for postgraduate courses is very strong, and distance education gives students the ability to study in their own time and place. We are also seeing students choosing a mix of internal and external study because of the flexibility that online distance education now provides 25.

Online technology has enabled universities to deliver existing material in different ways, but the interesting thing is that online interaction has allowed for a greater engagement of students. Best practices in education now emphasize less about delivery of course material, and more about how students interact with other students, staff and their learning activities in ways that enrich their learning experiences. With more programs available online, many universities have had to restructure their courses. Some are offering wholly

online courses; others, a mix of online education and on-campus workshops. Online tools have become more comprehensive, with online learning management systems allowing students control of when and where they learn. Online tools include peer mentoring programs, call out, and electronic messaging (e.g., MSN), allowing for regular communication with students from anywhere in the world 25.

Infrastructure and funding are among the important ones, but scepticism about the pedagogic value of e-learning and staff development are probably the most challenging. The limitations of e-learning and present software tools may account for some of the resistance by academics. However, it can also be explained by a lack of time or motivation to carry out what is basically an additional task, since e-learning mostly supplements rather than replaces classroom-based teaching, coupled with insufficient literacy either in information and communications technology in general or in e-learning applications. Yet e-learning nonetheless has brought benefits. Even if Internet and Communication Technology (ICT) has not revolutionized the classroom yet, it is changing the learning experience of students by relaxing time and space constraints, as well as providing easier access to information (online journals and e-books, student portals, e.g.), an achievement that should not be downplayed 26.

It can be argued that the implementation of RALs for our practical courses will eliminate the costs and time in attending the current residential schools by students and will encourage more students to view our degree programs more favorably.

CONCLUSION

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Flexibility in course delivery is a major beneficiary from the development of online courses. However, in some courses such as engineering, it may be beneficial to have some avenue (or at least made available) for face-to-face interaction during time of studies. Therefore, though online courses or e-learning are seen as the major driver of tertiary education in Australia currently, it may not be as beneficial if operated totally over the internet, but to package it with other delivery modes to create the flexibility in the course. One of these courses that are in this flexible category is in the Bachelor of Engineering within USQ.

The offer of the total external mode of Bachelor of Engineering in USQ is made possible by the implementation of innovative residential school in which practical courses were made independent of academic courses 7. These courses teach students the skills to carry out experiments to solve engineering problems and to write reports at professional engineer level as well as techniques for teamwork and interacting with peers. In the first few years of the offer, students from South East Asian countries are uncertain whether their degree can eventually be recognized by the professional institutions in their home countries but this is now clear that the degree will be recognized because the Institution of Engineers, Malaysia and the Institution of Engineers, Singapore are applying for the signatory members of the Washington Accord and they have to recognized a qualification that has been validated by professional institutions of signatory countries, which mean students from Europe and North America can also benefit from USQ Bachelor of Engineering programs, particularly when all of the practical courses can be accessed through RALs. Other RALs currently available can be found in an article written by USQ academics 21.

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Biographical Information

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Dr. Ku got his Associateship of Polytechnic from Hong Kong Polytechnic, his Master of Science in Engineering from the University of Hong Kong and his PhD from Swinburne University of Technology, Australia. Harry is the senior lecturer in manufacturing engineering in the Faculty of Engineering and Surveying, University of Southern Queensland. He is responsible for teaching manufacturing engineering courses, for example, production engineering. His research interests are in manufacturing and materials science as well as engineering education. Harry has served technical education in Hong Kong and higher education in Australia for more than 20 years. He has published more than 40 refereed journal articles in the areas of his research interests in the last 5 years.

Biographical Information

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Mr. Goh completed his BEng in manufacturing & materials at UQ, MBA (Tech Mgt) at Deakin Uni, MPA at USQ, and a Diploma in Company Directorship from AICD. He joined USQ as an academic staff in 2006 after spending 10 years in industry in various roles including R&D Manager, Business Development Engineer to Managing Director of his own firm, and is currently active in a number of boards. His research interests are in manufacturing & materials, engineering leadership, and technology transfer.

Biographical Information

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Dr. Antonio Ahfock holds Bachelor of Engineering and PhD degrees from Monash University, Melbourne, Australia. Since 1986 he has been teaching electrical engineering at the University of Southern Queensland. He has about 30 conference and journal publications in the areas of power engineering and engineering education. He has a strong interest in the use of computer technologies as teaching and learning tools. He is the project leader for the establishment of remotely accessible laboratories at the University of Southern Queensland.

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Dr. Magdy Iskander
Editor-in-Chief, Computer Applications in Engineering Education Hawaii Center for Advanced Communications University of Hawaii iskander@spectra.eng.hawaii.edu

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This paper describes the flexible delivery of engineering degree programs with remote access at the University of Southern Queensland in Australia. The flexible delivery of engineering courses is a challenging task for both academic staff and students. The paper is generally well written. However, the authors should focus on the computer applications in the flexible delivery of engineering courses rather than on the introduction to USQ. I recommend the paper be accepted for publication if the suggested revisions are made.

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